

## Preservice Elementary Teachers' Reflective Insights from Teaching Mathematics during an Authentic Early Practicum Experience

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*This content analysis examined 1,710 statements made in post-lesson reflections of elementary education preservice teachers (N=120) after their first and second unassisted lessons during an early practicum experience that accompanied a mathematics methods course. The activities constituted authentic learning experiences in which preservice teachers planned and executed two appropriate mathematics lessons featuring hands-on materials and open-ended problem solving for elementary students. Predominant reflection themes focused on elementary student motivation, student learning, improvement of lessons, student skill levels, student behaviors and feelings. The authentic learning format allowed preservice teachers to develop professionally, taking responsibility for their own learning with the support of their mathematics methods instructor, host teacher, and peers. Reflections showed that preservice teachers had become aware of the complexity of teaching, analyzing problems from many viewpoints.*

*Key Words: Preservice teachers, Early practicum experience, Mathematics education, Reflection*

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Extensive hours of field experience have been required by school of education accreditation agencies like the National Council for the Accreditation of Teacher Education in recent years (Vergari & Hess, 2002). However, limited research evidence is available that shows what preservice teachers gain from such early practicum experiences, most of it focusing on student teaching rather than earlier experiences (e.g., Chepyator-Thomson & Liu, 2003; Dobbins, 1996), and with only a few studies (Mewborn, 1999a, 1999b; Moyer & Husman, 2006) focusing on mathematics instruction. Therefore, this analysis of preservice teacher reflections on initial mathematics lessons contributes to a needed discourse in this area.

In the following sections, we review the theoretical underpinnings of reflective practice and pertinent literature on preservice teacher reflective learning during

practicum experiences in general and with respect to mathematics. Next we show how the activities discussed here constitute an authentic learning experience. Then we describe our study analyzing the reflections of preservice teachers following the planning and teaching of their first lessons in the field to determine the reflective insights they glean from their authentic public school-based teaching experiences.

### Learning from Practicum Experiences through Reflection

Dewey (1964, p. 211) found *reflection* to go beyond being merely a teaching tool to being an aim of education: reflective thinking “enables us to know what we are about when we act, it converts action that is merely appetitive, blind, and impulsive into intelligent action.” Dewey (1933) outlined the steps of reflection: (1)

feeling confused or doubtful about the situation in which one finds oneself; (2) speculation and tentative interpretation of the situation and its possible consequences; (3) observation and examination of the problem with which one is confronted and analysis of possible factors and considerations that will help define and clarify the problem; (4) Elaboration of hypotheses; (5) formulating a plan of action and then trying to implement a desired result. Dewey also acknowledged that attitudes, qualities and character traits (such as open-mindedness, sincerity, and responsibility) were important partners to skilled methods. Additionally, Dewey differentiated the contexts of reflection: retrospective reflection on past events, anticipatory reflection on future experiences, and contemporaneous reflection on in-progress experiences. The latter context of reflection is more difficult for new practitioners to achieve and is what Schön (1983, p. 54) calls "thinking on your feet" or "Having your wits about you." Van Manen (1995) suggests that *pedagogical tact* is needed during on-the-spot reflection. Such tact includes sensitivity to the feelings, attitudes, and understandings of students, appropriate interpretation of the significance of these perceived feelings, a sense of standards, limits and balance that guide the teacher in entering or distancing from students' situations, and moral intuitiveness of sensing what is right and doing it. These skills require a lot of reflective practice for development.

Many researchers have investigated student teachers' use of reflection. Dobbins (1996) conducted a four-year study of preservice elementary student teachers, finding that when they consciously reflected on their practicum experiences they had an enhanced learning experience, but were more tired and emotionally drained. Host teachers found that student teachers who

reflected on the experience exhibited improved classroom practices with a better effect for students. Dobbins facilitated reflection by setting aside time for preservice teachers to reflect, requiring journal entries, involvement in school-wide experiences, and discussion during group meetings.

García, Sánchez, & Escudero (2006) who anchor their ideas concerning thoughtful reflection in situated learning (Collins, Brown, & Newman, 1989) and communities of practice (Wenger, 1998), noted that reflection-on-action, interpretations of past classroom events, helped teachers and preservice teachers define their future actions. They suggested that mathematics educators help preservice teachers connect theory and practice through reflection.

Reflection, although taxing, is an important endeavor that leads to professional development. Hascher, Cocard, and Moser (2004) after a longitudinal analysis of preservice teachers through three phases of practicum experiences, raised important questions about learning outcomes from the field. They made a key distinction between two possible scenarios: preservice teachers experiencing the practicum as an apprenticeship in which they view their host teachers as experts and learn to act like them through social learning and imitation, as compared to experiencing the practicum as professional development in which preservice teacher learning is supported by host teacher mentors. This latter situation was more desirable for avoiding the pitfalls of preservice teachers developing an aversion to learning theory, which is necessary for generalizing and extending situations, and adopting the teaching practices to which they are exposed without reflection.

Parsons and Stephenson (2005) emphasized the importance of reflection in

deepening the practicum experience for preservice teachers. They defined students engaged in reflective practice as “aware of and able to monitor their own thinking, understanding and knowledge about teaching...” (p. 97). Such reflective preservice teachers identify problems in practice, situations where there is some doubt about how to proceed, or instances where something could be changed or improved. Parsons and Stephenson suggested discussion and collaboration with peers as a beneficial way to promote deeper reflection. This is echoed by Walsh and Elmslie (2005) who described a successful program in which preservice teachers were paired for their practicum experiences.

Parkinson (2005) employed an unusual technique in eliciting reflections from preservice teachers in a practicum that preceded student teaching – that of asking students to write a friendly letter in which they completed these prompts: (1) a new belief I have due to my practicum is...; (2) I wonder...; (3) I feel worried about...; and (4) I wish... She found that student reflections centered on five major themes: the realities of teaching; pedagogy and content; parents' roles; elementary students' needs, and preparedness for teaching. She concluded that preservice teachers' reflectiveness is developmental and must be nurtured in many ways throughout their teacher preparation experience.

The foregoing studies show that reflection on experiences assists preservice teachers in growing professionally and independently making sense of their experiences rather than merely acting as apprentices. In the next section we review the literature on preservice teachers using reflection during field placements related to mathematics.

### Reflection on Mathematics during Practicum Experiences

In a study of four preservice teachers during a field experience connected to a mathematics methods course (1999a), Mewborn identified four areas of concern for preservice teachers (listed in the order they were addressed): 1) matters of classroom organization and management apart from mathematics; 2) mathematics pedagogy; 3) children's mathematical thinking; and 4) mathematics content. When confronted with a new situation, preservice teachers tended to start again with the first area of concern and progress through the four identified stages. Mewborn found that the preservice teachers in her study engaged in all stages of Dewey's (1933) five stages of reflective thinking during the field experience, but only when they felt they were in authority (in charge of the lesson and reflection). Otherwise, they became passive consumers of reflection ideas generated by the host teacher or methods course instructor.

Mewborn (1999b) asked educators to pay more attention to the ecology of field experiences – the structure and content, the characteristics of placement sites, and the relationships between preservice teachers, host teachers, and supervisors. She identified three characteristics crucial to shifting the locus of authority to preservice teachers. The first component is an inquiry approach involving analysis of and reflection upon what happens in the field. Inquiry is supported when preservice teachers trust those with whom they discuss field experiences, and when they have the opportunity to discuss specific problematic situations and generate possible solutions. This requires that a significant amount of time be devoted to reflection and discussion of the field experiences. The second component identified by Mewborn

was a cohort peer group sharing experiences and developing a sense of community. The final important component of Mewborn was the nature of the school-university collaboration. The field experience is optimal when the methods course and field experiences are interwoven so that preservice teachers see examples of the mathematical ideas being discussed in the college classroom in the field and problems arising in the practicum are discussed in the methods classroom.

Moyer and Husman (2006) compared the reflections of preservice elementary teachers collected during the semester before student teaching under two conditions: 1) preservice teachers enrolled in a mathematics methods course taught at an elementary school with practicum experiences at that school, and 2) preservice teachers enrolled in a mathematics methods course on the college campus with practicum field placements at elementary schools. They identified four main categories in the data: relationships with children, relationships with the school, lesson performances, and future goals. Similar to Mewborn (1999a), they found that preservice teachers first addressed general classroom organization and management issues, then narrowed their focus to mathematics pedagogy, sometimes considered children's thinking, and very rarely reflected on mathematics content. However, they found that the group of preservice teachers immersed in the elementary school setting for their methods courses focused more on developing skills that would support them in their future careers as elementary teachers than those preservice teachers on campus who maintained a college-student focus. Those preservice teachers at the elementary school setting also had more opportunity for interactions in the school culture and for higher quality interactions. These impacted

their discussions of teaching mathematics and facilitated their understandings of how mathematics fits into the role of a teacher and how their practice lessons fit into the social and political context of schooling. Moyer and Husman found that campus-based preservice teachers focused more on classroom management and mathematics pedagogy issues, while the school-based preservice teachers advanced to also discuss children's thinking.

Our study adds to the current literature by examining written reflections of a much larger group of preservice teachers after teaching their first two lessons. Additionally, these reflective insights relate specifically to their experience of teaching their first lessons, rather than more generally related to their overall practicum experiences.

Although the mathematics methods course was campus based and the field experiences took place mostly at urban schools in a nearby large city, the set-up of the current study otherwise supported Mewborn's (1999b) three components of ecology for effective field experiences. The methods course instructor integrated discussions of the field experiences with the course, facilitating the integration of the field placement with the course as much as possible. Cohorts of students carpooled to the field placements and students discussed field placement issues in small and large groups during the course, providing a sense of community. Preservice teachers assumed the position of authority, planning and executing two open-ended problem-solving mathematics lessons with elementary students and reflecting in writing upon these experiences, thereby supporting inquiry into the teaching-learning process. We analyzed these reflections to discover the types of reflective insights they had after teaching their first lessons in an early practicum experience. In the next section we explain

how the lesson experiences described here constitute authentic learning experiences.

### An Authentic Learning Experience

Rule (2006) found four themes that recur in authentic learning experiences: 1. Students conduct inquiry and use thinking skills and metacognition; 2. Students are involved in the work of professionals and make connections to the real world; 3. Students are part of a community of learners and engage in meaningful discourse; and 4. Students are empowered through choice in some aspects of the learning experience. In the following sections, we show how designing and teaching two mathematics lessons during a practicum experience at a public school qualifies as authentic learning for preservice elementary teachers.

#### *1. Students Are Involved in Inquiry*

Preservice teachers needed to consider many different factors in choosing/designing their lessons: constraints such as supporting the state standards and being approved by the host teacher, the needs and interests of the elementary students with whom they worked, their own interests and mathematical strengths, resources for producing the hands-on mathematics lesson materials, and time constraints. These variables allowed many different solutions to the problem of choosing appropriate lessons. Preservice teachers designed an identical pretest-posttest instrument related to lesson content that they administered to elementary students before and after each lesson. This information about student performance helped them as they reflected on the first lesson and prepared for the second one a few weeks later.

Preservice teachers each wrote a one-page analysis of each lesson experience, describing what happened during the lesson,

what aspects they might continue or change, and what they learned from the experience. These reflections formed the raw data for this study. Hands-on lesson materials were presented during class with peers scoring the materials with a rubric, noting strengths and suggestions for improvement.

The assignment involved authentic assessment of preservice teacher performance. The instructor graded the lesson plan projects on the correspondence of lesson plans and materials to effective teaching of mathematics, using the Launch-Explore-Summarize teaching model as recommended by research following the Third International Mathematics and Science Study (Annenberg Media, 2000). Host teachers evaluated preservice teachers on professional dispositions and efficacy in working with students.

#### *2. The Work of Professionals in the Real World*

The mathematics methods course promoted authentic, learner-centered mathematics with hands-on representations of concepts presented through a problem-solving approach. Teaching two lessons to elementary students during the practicum experience was a natural part of the course in which preservice teachers implemented instructional methods they were learning.

Besides learning mathematics content and lesson planning, preservice teachers discovered how classrooms operate and how to interact with other professionals and elementary students, understandings not available in college classrooms (Brown & Kysilka, 2002). To be effective, today's teachers must "be students of human behavior, social events and their causes, and the characteristics of the citizens they serve" (Blair & Jones, 1998, p. 77). Preservice teachers needed to develop both professional (e. g., classroom discipline, pupils, curriculum, school culture) and cultural

understandings (e.g., pupil's living conditions, cross-cultural communication, historical understanding) to see the multiple realities of a classroom and its community setting (Stachowski & Frey, 2003). Therefore, preservice elementary teachers were preparing for their future careers as teachers as they conducted these first lessons during practicum experiences.

### *3. Discourse among a Community of Learners*

Preservice teachers interacted cooperatively with the host teacher, with elementary students, with peers, and with the instructor to successfully complete the problem. Observations of elementary students and discussions with host teachers allowed preservice teachers to design effective lessons. Preservice teachers worked together in small groups during the methods course helping each other understand mathematics concepts, planning lessons, and discussing their practicum experiences. The mathematics instructor (first author) scaffolded learning throughout the course by addressing mathematics topics in developmental order, representing concepts concretely with manipulatives, and teaching through a problem-solving approach. The two lessons taught by preservice teachers occurred near the end of the semester-long course, when they were well prepared to tackle this complex assignment. Preservice teachers had the opportunities, both during class discussions and informally before and after class to discuss their field observations and experiences with peers. Additionally, in most situations, several preservice teachers were assigned to the same classroom and many students carpooled for the forty-five minute ride to the school, discussing ideas during the trip.

### *4. Empowerment through Choice*

Preservice teachers were enrolled concurrently in a mathematics methods course and the practicum experience. They chose the two lessons that they planned and executed (generally for a small group of learners) with the provision that these lessons supported the state curriculum, were agreeable to the host teacher, and involved problem-solving with hands-on materials. Preservice teachers were encouraged to challenge themselves by choosing less familiar mathematical concepts that might require more preparation.

## Method

### *Participants*

One hundred twenty preservice teachers (105 F, 15M; 116W, 4B) at a public mid-sized college in central New York State enrolled concurrently in one of five sections of a mathematics methods course taught by the same instructor and a practicum field experience at an area elementary school participated in the study. This course occurred during the second semester of the junior year for most students, and was the second of four practicum experiences that culminated in student teaching, but the first in which a formal lesson was taught to elementary students.

### *Procedure*

The study was a mixed-methods design involving a content analysis of preservice teacher reflections, including frequency counts of categories of ideas, and triangulation with other qualitative data from another study (Rule and Harrell, 2006) of the preservice teachers from two of the five sections of the course.

Each preservice teacher planned and implemented for elementary students two mathematics lessons that involved hands-on materials and open-ended problem-solving. Most lessons were conducted with a small

group of students, but a few preservice teachers were asked to engage the entire class. Preservice teachers designed one-page "quizzes" to assess student learning before and after the lesson on the instructed concepts. The results from the assessment and events during the lesson were described and analyzed in a one-page reflection written by each preservice teacher for each of his/her lessons that was attached to the lesson plan. Instructions for the reflection were to provide a one-page word-processed reflection that gave the five or six most important events that occurred during the lesson and then a paragraph of reflection about what was learned from teaching the lesson. No example reflections were provided, nor were additional instructions or suggestions provided. This ensured that the preservice teachers decided the content and directions of their reflections.

During the content analysis, each reflection was divided into a series of idea statements which were usually one sentence long, but varied between a half-sentence and two sentences. These idea statements were transcribed word for word onto separate lines of a spreadsheet. There were 1710 statements in all. These were read and re-read until several statements were found that relayed the same or similar ideas. In the second column of the spreadsheet, a short phrase was entered that captured the essence of the idea. After all statements had been categorized in this way, these short phrases in the second column were grouped into more general ideas, which were written in the next column. This process was continued until four levels of classification were achieved and major themes of the reflection statements were identified. This inductive method of initial open coding resulted in categories grounded in the research data (Creswell, 2005). The frequency of statements in each category was determined.

Triangulation of results was achieved by comparing themes from reflections to the results of a study by Rule and Harrell (2006). The participants in Rule and Harrell's study were 52 of the same participants in the current study (two of the five sections of the course). In Rule and Harrell's study, at the beginning and end of the course, preservice teachers drew images representing three events that shaped their current attitudes toward mathematics. They also listed associated emotions and wrote short self-analysis of what the images mean with regard to teaching mathematics to elementary students in their future careers. Although only data from 52 preservice teachers were included in Rule and Harrell's study, all preservice teachers in the current study participated in these activities.

Additionally, the reflection data were analyzed to compare male versus female responses to discern any trends, although the number of males in the study was small. Preservice teacher reflections on the first and second lessons taught were also compared to determine growth in the reflective process.

## Results and Discussion

The content analysis of reflections revealed six main categories of response: student motivation, student learning, student skills, student behavior, teaching/ revising the lesson, and feelings of both students and preservice teachers. Each of these six major categories is discussed in the following sections with example quotes from the reflections given to illustrate the ideas.

The six main categories identified in this study reveal preservice teachers' focus on students during the practicum. College methods classes tend to focus on pedagogy of teaching the subject area content. Although instructors do spend time talking

about the attitudes, skills, and learning of elementary students, it is in the practicum that preservice teachers actively observe these factors. Naturally, then, elementary students, what motivates them, how they learn, what skills they have, and how they behave, are at the center of their thoughts. Another category, teaching/ revising the lesson, results from preservice teacher's main task during the practicum: to deliver two effective mathematics lessons. The emotional aspects of the entire experience comprise the final category.

Similar to the preservice teachers in Moyer and Husman's study (2006), the preservice teachers in our study rarely discussed the mathematics content in their reflections. However, because our preservice teachers' reflections were directly related to mathematics lessons they taught, our students paid less attention to general

classroom organization and management issues, focusing more on mathematics pedagogy and management related directly to their lessons. Also in contrast to Moyer and Husman, our students considered student thinking about mathematics more frequently, possibly because they had pretest/posttest results to consider.

*Student Motivation*

Subcategories of statements related to student achievement are displayed in Table 1. Comments related to student motivation were the most numerous of all the statements made by preservice teachers, possibly because they openly reflected on their own past experiences and feelings as elementary students during the course as various elementary topics were addressed.

Table 1  
*Categories of Statements Related to Student Motivation*

General Category	N	Subcategory	N	More Detailed Subcategory	N	
Student Motivation	372	Excitement Related to Manipulatives	177	Students excited, enjoyed manipulatives	90	
				Next time will add or modify manipulatives	41	
				Students wanted to extend their time/ lessons with manipulatives	15	
				Students fascinated with tactile aspects of manipulatives	9	
				Observation that manipulative lessons were different than those traditionally taught in classroom	8	
				Students were overexcited about the manipulatives	8	
				Students were engaged during manipulative lessons	6	
				Factors	154	Enthusiasm and motivation displayed
		Affecting Motivation			Interest affects task engagement	19
					Students were motivated because they felt special	17
					Students wanted to continue working on math activities	16
					Students' pride in understanding/ accomplishment	13
					Other students wanted to participate	9
					Novel activity or game sparked interest	9
					Lack of interest or boredom shown	8
					Choice of favorites or ownership motivated students	8
					Frustration does not motivate	6
					Considering adding reward to motivate	4
					Safety of situation promotes participation	2
					Beauty Appreciation	41
Change materials to make more colorful	17					
Change materials to make more durable	6					

*Factors affecting student motivation.*

Preservice teachers noted the enthusiasm displayed by students for their activities. Example statements included: "Being able to work with a student who was so eager to hear what I had to say was a big encouragement and it is the kind of teaching atmosphere that I think all teachers crave;" and "The student I worked with was always behind, but he hurried to do this project."

Preservice teachers saw that a student's interest in the activity strongly affected motivation to participate, as indicated by, "I learned that involving topics of interest when doing word problems makes a big difference," and "My host teacher thought that students were more involved because of the cake theme of the activity." Two participants made the following important insights, "I have realized that anything can be fun if presented correctly," and "I was able to change their attitudes and to get them excited about a subject that even I did not like when I was young."

The study participants observed with delight how students enjoyed working with them. They marveled at students' drive to continue working after the activity had been completed. Many preservice teachers acknowledged the importance of student's pride in work and sense of accomplishment. "Students were excited to take the posttest and show what they knew." "My student did all the cards. I thought it would have been overwhelming and repetitive, but she did it as a challenge." Additionally, they identified the novelty of an activity as inspiration for students and the importance of student choice of favorites and ownership to motivation.

Preservice teachers also identified times at which students showed a lack of motivation because of disinterest, boredom, or frustration. "This time I had a student who didn't want to participate and it was

difficult to persuade him." An interesting insight in this category was, "For the next lesson, I will reorganize the quiz so the last question is the hardest and students are not discouraged early on."

Finally, with regard to motivation, a few preservice teachers considered offering rewards, shown by statements such as, "If I do this activity again where student buy donuts with nickels, I'll provide real donuts at the end so students can eat them." Others affirmed to make the situation more comfortable for students, "In the future, I will create a more comfortable environment where the child can take risks," and, "The student started out shy but warmed up with my support."

*Excitement related to manipulatives.*

The subcategory with the most statements was that of student interest in, excitement related to, or enjoyment of manipulatives used during the mathematics lessons, confirming the motivating effects of involving students with concrete representations of mathematics. Ninety statements were recorded that expressed these sentiments; examples follow. "Students love manipulatives; it makes the lesson more interesting and fun for them." "Children called the lesson a game because they liked the manipulatives so much." "My student went back to the classroom to tell his friends how cool the stuff he worked with was." Students were often so enthralled with the manipulative lessons that they wanted to extend them. "Students asked if they could stay and play with the cards when the lesson was over." "One student asked to take the game home; I said, 'I'll bring it to class again.'" Excitement about manipulatives extended beyond the lesson, "During free time, one student drew bead bars."

Because of the effects of manipulatives on motivation and on understanding (discussed in the next section), many preservice teachers reflected

on how they would improve or add to their use of manipulatives in future lessons. "Next time I will make pretend wallets to go along with the purses with money clues." "All the class should learn with the teen numeral cards and bead bars so they will understand the teen numbers. I will have to make more sets."

Sometimes this enthusiasm became over-excitement, as shown by the following comments. "My student wanted to skip the review and get on with using the manipulatives." "I found that the students were overexcited about the manipulatives in the lesson and not focused on my explanations." This over-excitement may be related to the novelty of using hands-on materials. Students and preservice teachers observed that manipulatives were not generally used in many classrooms. "All the kids loved the flat marbles for dynamic addition. They do not usually get to work with this stuff and so they enjoyed it."

Many students enjoyed the tactile aspect of the manipulatives. "Students held the bead bars rather than placing them on the table because the beads were so cool." Several preservice teachers noticed that students were more engaged in lessons that included interesting manipulatives: "I had their full attention during the lesson because of the materials," and "One student who might have an attention deficit-hyperactivity disorder did focus when given the manipulatives."

*Beauty appreciation.* Forty-one statements addressed appreciation of the beauty of materials used in teaching mathematics. Preservice teachers noted children's attraction to colorful materials. Children's and preservice teachers' perceptions of beauty of mathematics materials affect mathematical performance (Rule, Sobierajski, & Schell, 2005). Children complimented the preservice teachers on making the attractive materials

and one preservice teacher observed, "The children were very careful with my pompoms and baskets, showing their respect for my hard work." Preservice teachers reflected on changes they would make to their materials to make them more attractive or durable.

*Triangulation with other data.* In the study by Rule and Harrell (2006) preservice teachers (actually, 52 of the same preservice teachers involved in the current study) drew three images (and also listed associated emotions) representing significant events that contributed to their attitudes toward mathematics at the beginning and end of the course. In the beginning of the course, almost two-thirds of the images and associated emotions were negative, whereas at the end of the course, about 70% of the images and emotions were positive. Preservice teachers were also asked to analyze their images and interpret them considering that they were preparing to be mathematics teachers. These statements were compiled and analyzed for major themes. The most frequent themes on at the end of the course were that manipulatives are necessary for effective mathematics, and mathematics must be made interesting and engaging to students. The most frequently drawn positive images were of manipulatives used during the course, followed by smiling faces, and images of preservice teachers delivering practicum lessons. Certainly the practicum experiences had a positive effect on attitude and motivation of preservice teachers. Therefore, preservice teachers were very much aware of the attitude and motivation of elementary students during their practicum lessons, particularly noting successes in motivation students in their reflections.

Teaching mathematics presents challenges not encountered to the same extent in other subject areas. The main challenges are 1) the often poor preparation

of preservice teachers to understand mathematics because of the traditional, rule-bound, procedural way mathematics has been taught in the past; and 2) the unfamiliar new pedagogies of problem-solving and inquiry with ample use of manipulatives for concrete representation of concepts and frequent mathematical discourse. Consequently, many preservice teachers initially react to mathematics methods courses with fear of revealing their levels of mathematical understanding and resistance to learning new ways of teaching mathematics that seem foreign to them. Changes in attitude must occur during a

methods course for preservice teachers to become successful teachers themselves and it is therefore fitting that preservice teachers focused on attitude and motivation most frequently during their reflections.

*Student Learning*

The second-largest category of statements dealt with student learning. This is not unexpected, as preservice teachers were required to pretest and posttest their students on lesson concepts, therefore providing data for reflection. Subcategories of student learning are shown in Table 2.

Table 2  
*Subcategories of Statements Related to Student Learning*

General Category	N	Subcategory	N	More Detailed Subcategory	N		
Student Learning	310	Evidence of Learning	96	Students improved on posttest	48		
				Students showed improvement in understanding and skills during lesson	38		
				Surprised by students' speed of learning	8		
				Students showed they did not understand	2		
		Manipulatives help learning	82	57	57	Student understanding increased with use of manipulatives	44
						Need to have more manipulatives so more students may be involved	23
						Need different manipulatives to help student learn concept	15
		Language	57	57	57	Students lacking needed mathematics vocabulary	31
						Wording of exercises difficult or confusing for students	14
						Students experienced difficulty in reading	5
						Students lacked everyday background vocabulary	4
						Students confused by multiple ways of saying something	3
		Real world connections	38	38	38	Students made personal connections to math lesson	18
						Connection to a real life use of math made	8
						Students applied new technique to familiar circumstance	5
						Other subject area connected to math	4
						Need for more real world connections noted	3
		Involvement	30	30	30	Activity designed so all were involved	9
						Noticed that students need to have own sets of materials	9
						Students enjoyed posing their own problems	8
						Students should be independent and self-check work	4
		Order and organization	7	7	7	Organized activities help structure and facilitate learning	4
						Neatness is important	3

*Evidence of student learning.* Forty-eight statements addressed increases in pretest to posttest scores, indicating that students had gained knowledge from the lessons. Overall, 947 elementary students were taught by these preservice teachers with a mean pretest score of 6.1 out of 10 (standard deviation = 2.8) and a mean

posttest score of 8.5 out of 10 (standard deviation = 2.0). Only 6 children showed a decrease in performance from pretest to posttest, while 193 had the same pretest and posttest scores, with over half (118) of those achieving ten out of ten on both the pretest and posttest (no room to show improvement). An analysis of variance

indicated that there was a significant difference between elementary student scores from pretest to posttest ( $\alpha = 0.5$ ;  $F_{\text{critical}} = 3.84$ ; degrees of freedom = 1/1854;  $p < 0.001$ ). This indicates that in general, elementary students displayed substantial performance gains after the lessons. Preservice teachers did grade the pretests/posttests, but included these with their lessons so that the instructor could examine the grading. Additionally, elementary student scores did not play a role in the preservice teachers' grades for the assignment and the instructor emphasized the need for preservice teachers to use the information reflectively rather than viewing it as a scoring contest.

This gain in understanding is reflected in statements made by preservice teachers. "I reviewed place value during my second lesson and found that students remembered a lot from my first lesson." "The practicum teacher expressed to me how she liked the activity and how much my student had progressed!" "Overall the child I worked with learned a lot about making maps and schedules."

Preservice teachers expressed surprise at how quickly students caught on to lesson ideas. "I was shocked at how quickly the kindergarteners understood the lesson and were counting by tens." Only two preservice teachers noted student difficulties in understanding: "A student asked me a question that made me realize that the he did not understand what I was explaining," and "The students' score did not change after the lesson."

*Helpfulness of manipulatives to student understanding.* Preservice teachers wrote forty-four statements expressing the usefulness of manipulatives in helping children understand mathematics. "All but one child stated that having coins made it easier to figure out the coins in the coin purses from the lists of clues." "As I was

completing the activity related to teen numbers, students told me that they liked this way of learning because they can see how one bead bar represents ten."

*Vocabulary and language.* Participants noted that many children lacked the necessary language skills or vocabulary to succeed in their mathematics lessons. They found that many students were unfamiliar with coin names, inequality symbols, skip counting, multiples, or terms such as "addend," "sum," "dynamic," and "static." Students had difficulty with some everyday vocabulary along with listening and reading comprehension. One preservice teacher wrote that sometimes it was hard to word the questions so that students would understand. Another observed that third graders had difficulty reading number words.

*Connections to the real world.* Many participants made connections to other subjects and everyday life as they taught their lessons, as in this excerpt from a reflection, "Students enjoyed the book I wrote about time and thought it was cool to write a book in math class." Another preservice teacher noted that during her lesson, "Students found examples of teen numbers inside and outside the classroom." During a lesson on coins, another participant observed, "As I reviewed, students made connections to their previous experiences with money."

In the *Principles and Standards for School Mathematics*, the National Council of Teachers of Mathematics (2000, p. 15-16) states that a mathematics curriculum should focus on important mathematics: "the curriculum should offer experiences that allow students to see that mathematics has powerful uses in modeling and predicting real-world phenomena." After an exercise is using a zoo map to make a time schedule for visiting animals, a student remarked that he will be able to read a map next time he goes

on vacation. An insight from another preservice teacher about a different lesson expressed these sentiments, "I'm glad that she was able to make personal connections to my lesson because I think it will help her to remember the information."

*Active involvement.* The NCTM (2000, p. 18) acknowledges, "Teachers establish and nurture an environment conducive to learning mathematics through the decisions they make, the conversations they orchestrate, and the physical setting they create." Active involvement of students in mathematics is essential to their learning. Thirty reflection statements recognized student involvement in mathematics with such comments as, "Students enjoyed the problem posing aspects," and "They had fun creating different examples to make the expression true." Insights such as, "Next time I'll make more manipulatives so all students can be involved," show preservice teachers recognized the value in active involvement.

*Order and organization.* Seven statements revealed appreciation of order and organization, two concepts intimately tied to mathematics. A well-structured mathematics curriculum is more than a collection of activities; it must be coherent to effectively organize and integrate important mathematical ideas. Similarly, a single lesson must be focused and orderly. Several participants noted that well-organized activities facilitated student learning. Others noted the importance of neatness in mathematical work.

*Triangulation with other data.* In Rule and Harrell's study, preservice teachers noted that they had learned important pedagogy of teaching mathematics, had a more positive attitude about teaching mathematics as a result of the course and were very much looking forward to teaching mathematics to elementary students.

#### *Teaching and Revising Lessons*

Preservice teachers considered the components of effective teaching in their reflections, addressing timing ("Next time allow more work time so they can problem solve."); review of concepts ("I reviewed the greater than less than symbols and that was good because they didn't remember them"); preparation ("Next time be more prepared and not leave items out in my car."); challenge ("Students enjoyed sorting clues and determining the coins. It was challenging"); explanations ("A student shared a mnemonic device for recognizing a penny as different color than other coins"); practice ("Students needed more examples and practice before they were able to move on."); simplifying ("Next time, use only phrases with pennies as the other coins were too hard."); and expectations ("I thought some students would have problems but I was wrong. They surpassed my expectations and wanted to count way past 100"). More details of these categories are provided in Table 3.

**Table 3**  
*Subcategories of Statements Related to Teaching/ Revising Lessons*

General Category	N	Subcategory	N	More Detailed Subcategory	N		
Teaching/ Revising the Lesson	286	Timing	53	Needed more time to complete planned lesson	22		
				Rushed through the lesson because there wasn't time	10		
				Host teacher cut off preservice teacher's lesson	6		
				Lacked preparation and so timing was poor	4		
				Desired to extend the lesson, but no time	4		
				Pretest/posttest took longer than expected	4		
				Student questions took a lot of time	2		
				Pacing of reading pretest/posttest questions difficult	1		
		Review concepts	51		46	Next time will review concepts prior to lesson	23
						In the future, take more time to review more ideas	7
						Initiated a review in response to student questions	7
						Need to find ways to improve the review of skills	5
						Began lesson with a review of background skills	5
		Preparation	40		40	Students caught on quickly after the review	4
						Will change the lesson set-up to remedy problems	19
						Will improve the pretest/posttest	8
						Was not prepared for unanticipated student questions	5
						Next time will practice lesson first to improve it	4
		Challenge	46		46	Need to make an additional reference chart or model	4
						Pretest/posttest was too easy or too hard for students	9
						Needed to make lesson more challenging for students	8
						Make the activity more complex to challenge students	7
						Students need support when the activity is challenging	5
						Preservice teachers were challenged by creating lesson and pretest/posttest	6
						Many students appreciate challenging tasks	4
						Independence makes the lesson more challenging	4
		Need to find harder questions to ask	3				
Explanations	42		42	Model and give more examples to improve explanation	18		
				Student reactions indicated inadequate explanations	12		
				Thought of hints to help students	5		
				Mnemonic devices given helped students	3		
				Difficult to provide the best level of explanation	2		
				Initial confusion in problem solving is normal but students are not used to this.	2		
Practice	28		28	In the future, provide more practice for students	15		
				Student performance / understanding improved with practice	11		
				Desired to leave activity for students to practice later	2		
Simplify	14		14	Start with easier or more limited problems	10		
				Break the activity into smaller steps	4		
Expectations	12		12	Underestimation of student skills/ knowledge	9		
				Overestimation of student skills/ knowledge	3		

Table 4  
Subcategories of Statements Related to Student Skills

General Category	N	Subcategory	N	More Detailed Subcategory	N				
Student Skills	285	Skill level	169	Noticed that numeration and place value skills were poor	36				
				Stronger foundation in math and basic skills needed	25				
				Clocks and time concepts difficult for students	25				
				Students had adequate skills for lesson	19				
				Underestimated the abilities of students	14				
				Overestimated the abilities of students	13				
				Inequalities were a difficult concept for students	12				
				Pretest performance was poor	9				
				Lesson needed to be adjusted for poor performers	7				
				Students' reading skills were poor	6				
				Noticed that students had poor memory skills	3				
				Diversity of ability	77	39	77	Noticed that students performed at different skill levels	32
								Additional assistance was needed by some students	17
		Desire future work with a more diverse group of students	11						
		Recognized the need for more advanced work for high achievers	10						
		Some learners needed to repeat the lesson to grasp the concepts	4						
		Problem solving newness	39	39	39	Gender differences in performance were noted	3		
						The complex, applied activity challenged students	17		
						Students enjoyed acting like detectives	7		
						Students were puzzled and lacked confidence at first	6		
						Students had difficulty understanding complex directions	5		
		Multiple correct solutions were surprising to students	4						

*Student Skills*

This aspect of practicum reflections, shown in Table 4, revealed preservice teachers' surprise in observed skills of students, the diversity of abilities indicated by performance, and the outdated approaches being used in many contemporary classrooms.

Skill levels. The skill level subcategory was the second largest subcategory of responses, second only to statements about manipulative excitement. This is understandable because, after all, lessons are designed to improve student knowledge and skills. The mathematics methods course in which the preservice teachers were enrolled emphasized place value as one of the big ideas of mathematics. Therefore, it is not surprising that 36 statements expressed preservice teachers' dissatisfaction in the place value and numeration skills observed in students in the field, noting student difficulty with one-to-one correspondence in counting, confusion of odd and even numbers by upper

elementary students, difficulty in regrouping, and lack of various place value skills. Participants also found that students struggled with elapsed time concepts and inequalities. However, almost equal numbers of preservice teachers wrote that they over- or under-estimated the abilities of the students for whom they designed lessons. Many made adjustments for low performers during the lesson. Besides mathematics skills being discussed, several reflections mentioned student problems with reading and memory.

Diversity of ability. Many participants observed that students performed at different skill levels during the lessons, noticing that, "one student got the concept right away while the others struggled." Another saw that, "Students took different amounts of time to think and respond." Several realized that some students needed individualized lessons: "I think you should make sure to have extra work or practice for high achievers," and, similarly, "I had difficulty keeping more

proficient students busy while slower students worked." The importance of review and repetition, along with observed gender differences were noted.

*Problem solving newness.* The lessons taught by preservice teachers in this study were open-ended, somewhat complex problems that integrated several background skills. Most of the classrooms in which preservice teachers were placed practiced

traditional methods of mathematics instruction. Students were at first confused by problems-solving. Students felt challenged, but enjoyed their role as detectives in figuring out the solution. Example statements for this category include: "Students were really challenged by the inequalities," and "At first they were discouraged by all the different answers until I explained how each was correct."

Table 5  
*Subcategories of Statements Related to Student Behavior*

General Category	N	Subcategory	N	More Detailed Subcategory	N			
Student Behavior	236	Discipline	90	Challenging to keep students on task	24			
				Encountered jealousy and other emotional issues	14			
				Important to assign tasks for order and fairness	14			
				Exercised a teacher's authority to maintain order	9			
				Next time will work with fewer students for control	8			
				Witnessed misbehavior and acting out of students	7			
				Need rules of raising hands and responding	5			
				Witnessed students cheating	5			
				Lack of space and overcrowding caused problems	4			
				Peer interaction	79	Peer interaction	79	Peer tutoring occurred during lesson
			Students worked cooperatively on the activity	17				
			Students showed care/respect for materials or others	14				
			Competition between students was observed	13				
			Students encouraged their peers	4				
			Some students dominated or were very assertive	3				
			Gender issues noticed: boys preferred working with boys	3				
			Distraction	67	Distraction	67	Interruptions by teachers, students and events	21
				Other lessons being conducted distracted students			16	
				Materials distracted students from instruction			16	
				Noise distracted students			8	
				Students not chosen for lesson commented or asked questions and distracted students in lesson			6	

*Student Behavior*

A study of preservice physical education teachers' reflections on student teaching (Chepyator-Thomson & Liu, 2003) revealed that they focused mostly on techniques of class management and discipline, with secondary student teachers emphasizing these components (71.1% of reflective comments) more than elementary teachers (55.4% of reflective comments). Reflections on student behaviors were also a major component of the reflections analyzed in this study, in which preservice teachers discussed discipline, peer interactions, and

lesson distractions. Table 5 shows details of subcategories of comments about student behavior.

*Discipline.* First and foremost, preservice teachers noted the difficulty of keeping many students on task. Usually, these practicum lessons were taught in small groups of three to six students, but a few of the preservice teachers were requested by their host teachers to engage the entire class. Some preservice teachers remarked that they would work with fewer students next time for better control. Goodman (1991) states, "Reflection suggests much more than taking

a few minutes to think about how to keep pupils quiet and on task... Reflection implies a dynamic "way of being" in the classroom" (p. 60). Parsons and Stephenson (2005) stress the importance of preservice teachers recognizing their ideas and beliefs leading to their actions and considering if these underlying values are appropriate, then reconstructing their procedures if necessary. This deeper reflection occurred for many of the participants in our study as they witnessed misbehavior of students and considered what to do about it. Here are some examples: "When I was setting up, all three wanted to help – I should have had something for them to do," "None of them could wait for an answer and when you answer one first, all of them get mad that they were not first to be answered – I will have to explain to them that we will take turns," and "They don't think they need to give me the respect they do a teacher, but I simply explained to them that I was the teacher at the moment and they needed to act appropriately."

*Peer Interaction.* The majority of peer interactions reported were positive with preservice teachers noting how students engaged in peer tutoring without prompting, worked cooperatively, and showed care and respect. "A student who understood buddied with a student who struggled and helped him," "The thing that really got me was when everyone clapped at the answers. The students would cheer on each other and clap for those that got the answers right." Competition was also recognized and the fact that some students dominated the lessons: "Students raced each other to see who could match the clocks fastest," and "One boy made every part of the lesson into a competition, dominating the lesson."

*Distraction.* Preservice teachers noted the many distractions in the classroom and pondered how to deal with them. "Extra ESL children were present in the classroom

and their teacher conducted a different lesson with them - next time, I will include the ESL students so there is only one lesson going on and not so much distraction," and "The phone kept ringing during the lessons, so next time I'll have the lesson in a quieter environment outside the classroom."

### *Feelings*

Preservice elementary teachers have the highest levels of mathematics anxiety of all college majors (Hembree, 1990). Rule and Harrell (2006) found that participation in a mathematics methods course changed preservice teacher attitudes toward mathematics from predominantly negative to positive. The practicum experience was credited with some of the change as preservice teachers realized the importance of attitude, deep understanding of concepts, and the exciting sense of accomplishment in teaching others. Feelings, therefore, are an important part of teaching mathematics.

*The overall effect and feeling like a teacher.* Preservice teachers had overwhelmingly positive experiences in teaching lessons during their field placements; there were seventy-two statements in reflections saying that the activities went smoothly and they felt positive about the lesson. Many expressed that the experience allowed them to feel like a teacher. They felt pride in teaching others successfully and accomplishment in seeing eager students motivated by their lessons. Several mentioned that they grew professionally and/or learned mathematical concepts by teaching others. Acknowledgment of their contributions from the host teacher added to their feeling of being a professional. Six preservice teachers mentioned that the experience of teaching students during the practicum confirmed their decisions to enter the teaching profession.

Table 6  
Subcategories of Statements Related to Feelings

General Category	N	Subcategory	N	More Detailed Subcategory	N		
Feelings	221	Overall effect	72	Activities went smoothly; felt good about lesson	72		
				Felt like teacher	52	Felt pride in successful teaching of students	14
						Student enjoyment of lesson motivated preservice teacher	13
						Grew professionally and mathematically as a result of the lesson	12
						Felt respected as a teacher by host teacher	7
						Confirmed career decision to be a teacher	6
						Assessment anxiety of students	37
		Non-graded aspect relieved some student tension	6				
		Student concern about taking pretest without preparation	5				
		Fear that teacher would see poor pretest performance	4				
		Observed students working hard on pretest	2				
		Students irritated that the posttest was the same as pretest	2				
		Confidence	28		Preservice teacher gained self-confidence	11	
					Students gained self-confidence with support	9	
					Students were afraid to take risks for new lesson	8	
		Nervous	18		Practice helps ease nerves	8	
					Preservice teacher fear of disappointing others	4	
					Preservice teacher relaxed as lesson unfolded	3	
					Positive student reactions eased nerves	3	
		Effect on schools	9		Teachers adopted preservice teachers' activities for their classrooms	9	
		Complexity of teaching	5		Many different tasks must occur simultaneously during a lesson	5	

*Assessment anxiety of students.* Many students expressed concern about taking a pretest before they had been taught the lesson material. Many were afraid that if they performed poorly on the pretest, the host teacher would find out. "There seemed to be some uneasiness among the students about the pretest because they didn't know the answers and didn't like having to guess." Finding out that the pretest did not count toward their grades eased tension somewhat, but students were accustomed to having scores on quizzes carry consequences. On the second lesson, preservice teachers were more careful to explain that the pretest was merely a way for them to ascertain what students already knew.

*Confidence and nervousness.* Developing a professional identity is one of the most difficult issues at hand when a preservice teacher starts the first lesson; this evolving process can be one of stress and strain on the preservice teacher (Pittard,

2003). Nervousness or general anxiety was expressed in both the first and second lessons taught. A preservice teacher composing a first lesson reflection commented, "I got kind of nervous and was ready to give up. I think sometimes children intimidate me." Another writing a second lesson reflection noted, "It seems like I am always very nervous when it comes to presenting my own lessons, so I should practice more before I present." Knowing that other novices have the same feelings can help to restore confidence. Much of the anxiety precipitates from a desire to not fail the students and to appear as a professional in front of the host teacher.

Many preservice teachers reported gains in self-confidence as a result of their experiences: "I am slowly gaining the confidence that I feel is necessary for being in the teacher position," and "I was pleasantly surprised that my lesson plan was as effective as I hoped it would be." They

reported that students also made strides in confidence, as shown in this example comment, "The student learned from her mistakes and had more confidence in doing subtraction at the end of the lesson." However, the newness of the hands-on lesson formats intimidated some students, as shown in these statements, "A student pretended not to know so as not to make a mistake," and "At the start of the lesson, the students did not want to do the activity because it was new to them. This was an eye-opener to me as a preservice teacher as I did not realize that sometimes you have to coax even your best students to partake in an activity."

*Effect on schools.* The learning that occurs during practicum experiences occurs for host teachers, too. Nine preservice teachers reported that their host teachers adopted some of their activities for use in their classrooms, as shown by these examples: "My host teacher was excited when I told her I had this assignment and she was eager to see new materials she could use in her class with students," and "The teachers in my class and next door said how this checkerboard would be great as a permanent station in the classroom."

*Complexity of teaching.* Five preservice teachers noted the complexity of teaching, in which many different tasks occur simultaneously during a lesson. One remarked, "I also observed how very difficult it was to plan a lesson for kindergartners. I thought that kindergarten teachers got to play all day, but this is definitely not the case."

#### *Comparison of Female to Male Reflections and First to Second Lessons*

The sample population contained only 15 male preservice teachers, or 12.5%. Therefore, one cannot generalize too far from this small subset of the population. However, a few trends are worth noting.

Female preservice teachers wrote an average of 14.5 idea statements per preservice teacher, combining both reflections from lessons 1 and 2; male preservice teachers recorded somewhat fewer ideas with an average of 12.2 statements per preservice teacher. This may mirror the more verbal, chatty nature of women compared to men.

Table 7 presents data comparing female and male preservice teacher reflections. Female and male preservice teachers offered similar percentages of ideas related to student learning, student skills, student behavior, and feelings. However, female students provided more comments related to student motivation than males, while male preservice teachers gave more statements related to teaching and revising lessons than females. This may also reflect gender differences of females being more attuned to feelings, while males focus on executing and refining required tasks (Gray, 2004).

An increase in reflective observations occurred for both sexes from lesson 1 to lesson 2, probably because of the increased familiarity with writing a reflection and the larger store of experience. Second lessons tended to focus more on teaching and revising the lessons, particularly for males, and on analyzing student learning. The reflections of second lessons devoted fewer statements to student skills, student motivation, and student behavior, probably because these were more general observations of the students that were already discussed in the first lesson reflection. The statements related to feelings remained fairly constant for females, but decreased somewhat for males.

Mewborn's (1999a) ideas that matters of classroom organization and management apart from mathematics will be addressed first seem applicable to our results.

**Table 7**  
*Comparison of Numbers and Percents of Statements in the Six Categories by Sex and Lesson*

Group	Lesson	Student Motivation		Student Learning		Teaching / Revising the Lesson		Student Skills		Student Behavior		Feelings		Totals	
		Number of Statements	Percent of Total for Row	Number of Statements	Percent of Total for Row	Number of Statements	Percent of Total for Row	Number of Statements	Percent of Total for Row	Number of Statements	Percent of Total for Row	Number of Statements	Percent of Total for Row	Number of Statements	Percent of Total for Row
All Preservice Teachers	Both Lessons	372	21%	310	18%	286	17%	285	17%	236	14%	221	13%	1710	100
	Lesson 1	193	23%	123	15%	108	13%	156	19%	137	17%	109	13%	826	100
	Lesson 2	179	20%	187	21%	178	20%	129	15%	99	11%	112	13%	884	100
Female Preservice Teachers	Both Lessons	348	23%	285	19%	243	16%	240	16%	209	14%	202	13%	1527	100
	Lesson 1	180	24%	113	15%	93	13%	133	18%	122	16%	99	13%	740	100
	Lesson 2	168	21%	172	22%	150	19%	107	14%	87	11%	103	13%	787	100
Male Preservice Teachers	Both Lessons	24	13%	25	14%	43	23%	45	15%	27	15%	19	10%	183	100
	Lesson 1	13	15%	10	12%	15	17%	23	17%	15	17%	10	12%	86	100
	Lesson 2	11	11%	15	15%	28	29%	22	13%	12	12%	9	9%	97	100

### Summary and Conclusion

The foregoing analysis of preservice teachers' reflections after teaching their first and second lessons in an early practicum placement shows that they learned much about the essentials of teaching from this experience. Their focus was mostly on elementary students, what motivates them, how they learn, how to improve lessons to teach them better, along with observations of student skills, student behaviors, and feelings.

The preservice teachers in our study exhibited evidence of progressing through Dewey's reflective stages. During class discussions preservice teachers expressed confusion and doubt over how to go about teaching lessons. During lesson planning,

they attempted to prepare for students with special learning needs and to build in extra activities for those students who excelled or needed more practice. During their reflections, preservice teachers identified major events during their teaching and problems that had occurred. They attempted to explain why these events happened and to determine ways to improve their lessons for the future. Because they taught and reflected on two lessons, many were able to formulate a plan of action and attempt to implement a desired result.

The authentic nature of the experience in which the preservice teachers collaborated with peers and host teachers to determine a suitable mathematics lesson, executed the lesson, and reflected on it alone and through discussions with others assisted them in extracting essential aspects of the

experience and achieving professional growth rather than merely emulating the host teacher as previously discussed by Hascher, Cocard, and Moser (2004). Many of the reflective statements expressed inferences about cause and effect, underlying social issues, and moral responsibilities, indicating the professional growth experienced by the participants.

Similar to Moyer and Husman's findings, our campus-based preservice teachers focused mostly on classroom management and mathematics pedagogy issues, especially student motivation to study mathematics. However, many preservice teachers advanced to also discuss children's mathematical thinking, which is Mewborn's (1999a) third level of preservice teachers' concerns. This was particularly evident when they discussed the utility of manipulatives, language and vocabulary issues, real world connections that students made between the activity and everyday life, challenge of concepts, and the newness of the problem-solving approach. However, because all preservice teachers in this study were campus-based rather than participating in methods classes at an elementary school, we are not able to discern how a change of venue would affect the results as suggested by Moyer and Husman (2006). Additionally, although the instructor did not ask preservice teachers to give an example of student thinking and analyze it, this would probably facilitate preservice teachers' growth and should be implemented in future reflection assignments. The fact that many preservice teachers were able to engage in this sort of reflective analysis spontaneously is encouraging.

This analysis confirms the value of early field experiences in helping preservice teachers transition to the demanding position of teacher through authentic learning of planning and teaching of two problem-solving lessons to elementary students.

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